

# Graphene-Phosphomolybdate nanomaterial and its electrocatalysis for Oxygen Reduction Reaction

Diana Fernandes<sup>a</sup>, Marta Nunes<sup>a</sup>, Israel-Martyr Mbomekalle<sup>b</sup>, Pedro de Oliveira<sup>b</sup>, Cristina Freire<sup>a</sup>

<sup>a</sup> REQUIMTE, Departamento de Química e Bioquímica, Faculdade de Ciências, Universidade do Porto, 4169-007 Porto, Portugal

<sup>b</sup> Laboratoire de Chimie-Physique UMR 8000 CNRS, Université Paris-Sud, Bât. 349, Université Paris-Sud, 91405 Orsay Cedex, France

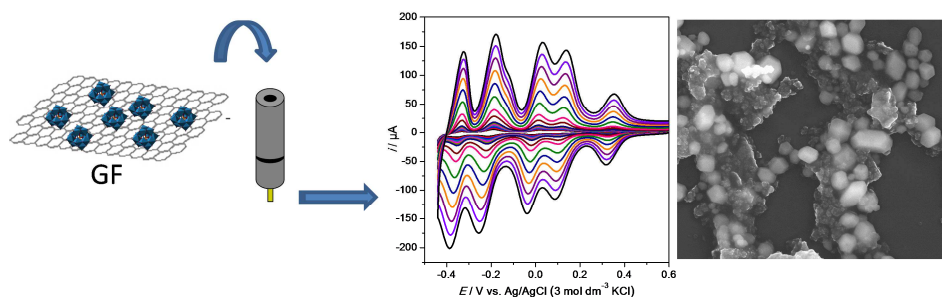
[Diana.fernandes@fc.up.pt](mailto:Diana.fernandes@fc.up.pt)

## Abstract

Since the discovery of graphene there has been much interest in investigating its physical and chemical properties due to potential applications in many fields such as electronics, energy and sensing<sup>[1-3]</sup>. Graphene is also an ideal material for electrochemical sensors due to its large electrochemical potential window and since it has good electron storage/accepting properties and a large specific surface area, it may serve as an excellent 2-D matrix to anchor different molecular species<sup>[4]</sup>.

Among the several molecules that can be immobilized on graphene are the polyoxometalates (POMs). These anions represent an important class of bulky clusters with application in a variety of scientific fields<sup>[5]</sup>. Immobilization of POMs in graphene is expected to increase the number of active centres that would improve electrochemical properties, but also their electrocatalytic properties.

In the present work, it is described the preparation of composite nanomaterial based on graphene and tetra-butylammonium salt of phosphomolybdate,  $\text{PMo}_{11}\text{V}$ . Investigations were focused on its structural characterization and electrochemical properties. Modified electrodes showed cyclic voltammograms consistent with surface confined redox processes attributed to Mo-centred reductions ( $\text{Mo}^{\text{VI}} \rightarrow \text{Mo}^{\text{V}}$ ) and a vanadium reduction ( $\text{V}^{\text{V}} \rightarrow \text{V}^{\text{IV}}$ ). More importantly, the nanocomposite showed superior electrocatalytic properties towards the  $\text{O}_2$  reduction reaction (ORR) and  $\text{H}_2\text{O}_2$  reduction reaction, in comparison with free POM.



## References

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